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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/832,272	04/10/2001	Kirk Prall	3969.3US (95-0310.3)	2827
24247	7590	02/10/2004	EXAMINER	
TRASK BRITT P.O. BOX 2550 SALT LAKE CITY, UT 84110			WARREN, MATTHEW E	
			ART UNIT	PAPER NUMBER
			2815	

DATE MAILED: 02/10/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/832,272

Applicant(s)

PRALL ET AL.

Examiner

Matthew E. Warren

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 22 December 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-52 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-52 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 12/22/03.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

This Application is in response to the RCE (with no amendment) filed on December 22, 2003.

### ***Claim Objections***

Claims 1, 3, 10, 13, 17, 22, 24, 31, 34, 38 are objected to because of the following informalities: all of the independent claims contain the limitation of an aspect ratio of 2.5." While the specification is enabling for the limitation, the specification explicitly states that the aspect ratio is "2.5:1." The quotation of "2.5" without something else to compare it to is not really a ratio, and is therefore confusing. Appropriate correction is required.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-52, as far as understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over Aoki et al. (US 5,629,539) in view of Iacoponi (US 5,545,592). Aoki et al. shows (fig. 1b) a dynamic random access memory array (DRAM) comprising a substrate (10), a plurality of memory cells, each cell having field effect access transistors and a stacked capacitor (21b, 27, and 28). The field effect transistors have

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source/drain regions (15b) that function as storage node junctions and are connected to the capacitor of the memory cell. The transistors also have second source/drain regions (15a) which functions as an access node junction and an insulated gate (13) overlying the substrate. The gate is insulated from the substrate by a gate dielectric (12) of silicon oxide and has vertical sidewalls (16) and an upper surface which are both covered by a dielectric of nitride (14). The gate electrode (13) comprises doped polysilicon. Along the length of the substrate, other access transistors are insulated from the substrate by a field oxide region (11). An interlevel dielectric layer (31) comprising a second dielectric material is blanketed over the substrate to a level above the capacitors. A plurality of digit line contact openings (having 21a and 24a) penetrate the interlevel dielectric layer and terminate at an access node junction (15a). The contact opening is self-aligned with the first dielectric material of the sidewall insulation of the gate because the contact is adjacent to the gate. The contact opening may be filled with a layered structure including tungsten and titanium (col. 8, lines 40-46). A digit line (33) is formed on top of the interlevel dielectric layer and makes electrical contact to the tungsten plug. Aoki shows all of the elements of the claims except the digit line contact opening having the specific titanium and CVD TiN and tungsten layer formed on the access node junction. Iacoponi shows (figs. 7) a contact structure comprising a contact opening formed in an interlayer dielectric layer (130). An access node junction (in silicon material 100) has a layer of titanium silicide (120) formed on it. A layer of titanium (150) is formed on the sidewalls of the opening. A CVD titanium nitride layer (160) and CVD tungsten (170) are subsequently deposited to fill the openings (col. 1,

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line 60 - col. 2, line 4). The silicide layer is formed by reacting the titanium with the source/drain region (col. 1, lines 32-34). As can be seen from the figure, the titanium layer is overlying the silicide layer by does not make contact with the tungsten layer. The titanium/titanium nitride combination in conjunction with the silicide layer provides a low resistance electrical contact while the TiN provides a diffusion barrier for the underlying Ti layer and an adhesion promoter for the W layer (col. 1, lines 57 – col. 2, line 4). With respect to the limitation of the aspect ratio being at least 2.5 or 5:1, the it would have been obvious to one of ordinary skill in the art to make the aspect ratio within the desired range, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233. Furthermore, the limitation of the aspect ratio for the contact is well known for 256-megabit generation of DRAMS as stated in the applicant's Background of the Invention. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the contact opening of Aoki by adding a titanium metal layer and silicide to the access node junction of a transistor because Iacoponi teaches that such a configuration provides a low resistance electrical connection and adhesion promotion of tungsten.

With respect to the limitations of the CVD (chemical vapor deposited) titanium and tungsten and the reaction of titanium with silicon to form silicide, a "product by process" claim is directed to the product per se, no matter how actually made, *In re Hirao*, 190 USPQ 15 at 17 (footnote 3). See also *in re Brown*, 173 USPQ 685; *In re Luck*, 177 USPQ 523; *In re Fessmann*, 180 USPQ 324; *In re Avery*, 186 USPQ 116 in

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re Wertheim, **191 USPQ 90** (**209 USPQ 254** does not deal with this issue); and In re Marosi et al, **218 USPQ 289** final product per se which must be determined in a "product by, all of" claim, and not the patentability of the process, and that an old or obvious product, whether claimed in "product by process" claims or not. Note that Applicant has the burden of proof in such cases, as the above case law makes clear. "Even though product-by- process claims are limited by and defined by the process, determination of patentability is based upon the product itself. The patentability of a product does not depend on its method of production. If the product in product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product is made by a different process." In re Thorpe, 227 USPQ 964, 966 (Fed. Cir. 1985)(citations omitted).

### ***Response to Arguments***

No arguments were filed.

### ***Conclusion***


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew E. Warren whose telephone number is (571) 272-1737. The examiner can normally be reached on Mon-Thurs, and alternating Fri, 9:00-5:00.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (571) 272-1664. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

MEW  
*MEW*  
February 5, 2004

  
**ALLAN R. WILSON**  
**PRIMARY EXAMINER**